Rev 09/09

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application	:	Pascal Diss et al.
Application No.	:	10/566,067
Filed	:	January 26, 2006
Confirmation No.	:	2032
For	:	PROTECTION AGAINST THE OXIDATION OF COMPOSITE MATERIAL PARTS CONTAINING CARBON AND PARTS THUS PROTECTED
Examiner	:	Austin Murata
Attorney's Docket	:	BDL-494XX

TC Art Unit: 1712

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PRE-APPEAL BRIEF REQUEST FOR REVIEW

Via Electronic Filing
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

In response to the Final Office Action dated May 25, 2010 and the Advisory Action dated July 28, 2010, and further in view of the Notice of Appeal filed herewith, Applicants hereby request review of the final rejection in the above-identified application, as it applies to claims 1, 4, 5, 7, and 8, prior to the filing of an appeal brief.

The Claimed Invention

Claim 1 recites a method of protecting a porous carbon composite material against oxidation at a temperature higher than 1000°C. The method includes impregnating the material in depth with an impregnation composition containing 20% to 70% (w/w) of at least one metal phosphate, 5% to 50% titanium diboride in powder form having a grain size in the range of 0.1 to 200 µm, 20% to 50% water, and 0% to 40% refractory solid filler other than titanium diboride. Note that the titanium diboride component is

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insoluble and particulate in the impregnation composition, and that the titanium diboride particles are sized to penetrate the porous material in depth.

Final Rejection and Advisory Action

The claims are rejected under 35 U.S.C. § 102 over de Nora et al. (U.S. 6,228,424), and/or under § 103 over de Nora in view of Morel (U.S. 5,420,084). The rejection states that de Nora uses a treating solution containing water, metal phosphate, titanium diboride, and refractory particulates. Applicants argued in response that de Nora does not teach the use of titanium diboride for in depth impregnation, that de Nora does not teach any combination of a metal phosphate with titanium diboride, and that such a combination would be unusable under de Nora's heating conditions, where they would react to form a highly viscous composition unsuitable for impregnation. The Advisory Action pointed out that de Nora contemplates combining a boride compound and a phosphorus compound in claims 15 and 17 and that de Nora teaches penetration to a depth of 3 cm. Applicants' representatives then requested an interview with the Examiner to further discuss the relevance of the de Nora reference, but the Examiner declined to have an interview.

Brief Summary of Issue for Appeal

Applicants believe that the Examiner has made clear errors of fact in applying the de Nora reference. As will be argued below, when de Nora is properly understood, it must be concluded that de Nora does not teach or even suggest the claimed invention.

Teachings of the de Nora Reference and Differences from the Claimed Invention

De Nora's strategy is to protect a carbon component of an aluminum production cell "by impregnating the surface of the body with a hot non-saturating liquid". de Nora Abstract, emphasis added.

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The liquid is then cooled after impregnating the surface, whereupon a treating agent precipitates "a layer" of the agent. de Nora Abstract. Thus, de Nora does not impregnate in depth.

De Nora's treating agent contains "at least one soluble compound of boron and/or phosphorus". C3, L52-53 (emphasis added). It is only these soluble boron compounds that penetrate the surface pores in de Nora's method. Soluble boron compounds for the treating agent are listed as "boron containing liquids based on B_2O_3, boric acid, tetraboric acid, salts of said acids, or boron silicate." C3, L56-58. The boron compounds are described as forming "a vitreous impervious layer in the surface pores". C3, L60-62, emphasis added. "Such a layer acts as a barrier to protect the pores of a carbon body from oxidation." C3, L62-64, emphasis added. It is clear that de Nora's method is not intended for in depth impregnation, but merely for impregnation of surface pores to form an impervious surface layer. Further, it is clear that de Nora requires soluble boron compounds to penetrate the surface pores.

While de Nora mentions penetration to a depth of 0.5 to 3 cm (C3, L24-25), this would form a mere surface layer in the very large structures envisioned by de Nora, such as cathode blocks for aluminum production. An important factor in de Nora's method is that the treating liquid is heated to a temperature "well above that of the body to be treated". C3, L1-2. The body then cools the treating liquid and causes precipitation of its components, such as the boron compounds, in the surface pores. Clearly, this limits the depth of penetration, because the boron compounds will precipitate once cooled, i.e., at a certain depth of penetration, thereby blocking any further penetration. Therefore, de Nora's method cannot be used for in depth penetration, because the penetration of de Nora's treating agent is self limiting due to precipitation in surface pores. de Nora fails to teach or suggest in depth impregnation as required by the present claims.

Unlike de Nora's method, which uses only soluble boron compounds for penetration, the presently claimed invention uses microparticulate titanium diboride for penetration. However, in a special embodiment de Nora uses particulate titanium diboride for a non-penetrating "top coating" or "surface coating" that blocks surface pores. C4, L35-47. In that embodiment, de Nora merely refers to the particles as "particulate

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refractory boride, such as TiB_2" without defining their size. C4, L44-47. Obviously, de Nora's particle size must correspond to his use of these particles to block surface pores; therefore, de Nora required a range of particle sizes significantly greater than the presently claimed range. It is unreasonable to suggest that the presently claimed range of particle sizes would have been obvious over de Nora, or could have resulted from routine optimization based on de Nora's disclosure. Any change of de Nora's particle size to allow in depth penetration as required in the present invention would have destroyed the purpose of titanium diboride particles in de Nora, since particles that penetrate in depth cannot block surface pores. de Nora therefore does not teach or suggest a grain size in the range of 0.1 μm to 200 μm, as required by the present claims. Any assertion that the claimed size range can be obtained from de Nora is based strictly on hindsight, with knowledge of the present invention.

de Nora's use of titanium diboride particles is specifically tailored for the surface coating of cathode blocks used in aluminum production. C4, L44-45. It is well known that such cathode blocks are surface coated with titanium diboride for its useful properties in the electrochemical reduction of aluminum oxide to produce aluminum metal. Those properties are summarized, for example, in U.S. Patent 3,028,324, and include providing a substantial reduction of the voltage drop at the cathode and the formation of good electrical contact with the mass of molten aluminum-containing metal in the aluminum production cell.

de Nora teaches the use of titanium diboride particles in a top coating suspension, or in a combined top coating and surface layer penetrating suspension ("impregnation or top coating liquid" C4, 44-47). In either case, titanium diboride is used exclusively to block surface pores and form a surface coating. de Nora's reference to the use of titanium diboride particles in an impregnation liquid clearly refers to the combination of soluble boron compounds for penetration and particulate titanium diboride to block surface pores and form a top coating in a single operation, instead of using two separate operations. de Nora does not even suggest using particulate titanium diboride for impregnation, much less for in depth impregnation.

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Finally, de Nora does not teach any specific composition containing both a metal phosphate and titanium diboride. While de Nora refers generically to use of phosphate and boride compounds in lists of possible treating agents and in claims 15 and 17, that does not equate to a suggestion to use the specific combination of a metal phosphate and titanium diboride. An ordinary skilled person would have recognized the incompatibility of these two ingredients when heated under de Nora's conditions. These components would have reacted at the high temperatures required in de Nora's process, rendering the treating solution too viscous for its intended use to penetrate surface pores. Therefore, de Nora cannot be read as suggesting Applicants' claimed combination.

In conclusion, de Nora does not teach or suggest: (1) use of particulate titanium diboride to impregnate in depth a porous carbon composite material; (2) use of titanium diboride having a grain size in the range of 0.1 to 200 μm; or (3) the combined use of a metal phosphate and titanium diboride in an impregnation composition. Therefore, de Nora does not anticipate the claims or render them obvious, even when combined with Morel.

Respectfully submitted,

PASCAL DISS ET AL.

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